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Management of euglenophytes in aquaculture ponds for improvement of fish production

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Abstract
Four experiments each with three replications were conducted in 12 experimental ponds to control the euglenophytes bloom viz. treatment 1 (T_1), covering of one third of the water surface by duckweed (*Lemna minor*); treatment 2 (T_2), application of 123.5 kg lime/ha/month; treatment 3 (T_3), use of both duckweed as in T_1 and lime as in T_2; treatment 4 (T_4) was considered as control where neither duckweed nor lime was applied. Fishes comprising of rohu (*Labeo rohita*), catla (*Catla catla*), mrigal (*Cirrhinus cirrhosus*), silver carp (*Hypophthalmichthys molitrix*) and silver barb (*Barbonymus gonionotus*) were stocked at the rate of 1080 fishes/ha with the species ratio of 8:4:6:9:13, respectively. The lowest cell density of euglenophytes was found in the ponds of T_3 followed by T_2, and T_1. In the ponds of T_3, euglenophytes bloom did not occur possibly due to alkaline pH, shade and nutrient absorption by duckweed. Thin bloom was observed in the ponds of T_1 where pH was neutral or slightly alkaline. The grazing on euglenophytes by the silver carp and silver barb also had some contribution in controlling the bloom. Growth of fishes was comparatively higher in the ponds of T_3 and T_1, which might be due to better water quality and availability of adequate food while the lower fish growth as recorded from the ponds of T_4 might be due to euglenophytes bloom. Thick bloom inhibited light penetration which hampered photosynthesis and growth of other phytoplankton that are the preferred food of planktivorous fishes. Mortality of fishes in ponds having euglenophytes bloom was possibly due to formation of anoxic situation in the early morning or due to the combined effect of anoxic situation and toxic metabolites secretion by the euglenophytes.

Key words: Euglenophytes management, Carp aquaculture, Fish production

Research findings

- Alkaline pH associated with shade formation and nutrient absorption by duckweed did not allow euglenophytes to form bloom in the experimental ponds. Neutral to slightly alkaline pH in ponds of T_1 allowed only thin bloom formation.
- Better water quality parameters and optimum availability of fish food items in ponds belonging to T_1 (duckweed treated) and T_2 (duckweed + lime treated) provided better growth of fishes.

- Periodic application of lime at the rate of 120-125 kg/ha and allowing duck weeds to cover one third of pond water surface prevented euglenophytes to form bloom, maintained better water quality and allowed better fish production.
- The grazing on euglenophytes by silver carp and silver barb also had some contribution in controlling the bloom.

Policy implications

- Policy makers should consider euglenophytes bloom as a potential threat to pond aquaculture development.
- The present observation "combined use of duckweed and lime was found to be effective in controlling euglenophytes bloom and maintenance of water quality as well as good fish production" needs further refining for the development of a package for dissemination among the farmers.
- If the package is available, arrangement should be made to train all the fisheries extension workers of GOs and NGOs with the help of researchers for dissemination of the technology.

Livelihood implications

Euglenophytes bloom has serious implications on the livelihoods of poor farmers. The farmers are facing increasing problem with water quality deterioration, reduced growth and even mortality of fishes due to euglenophytes bloom. The euglenophytes bloom as well as the cost of fertilizers and feeds could be reduced considerably by using duckweed which is easily available to the poor farmers. The duck weed could be used for dual purposes: i) for reducing euglenphytes bloom in hypernutrified ponds and ii) as a food for herbivorous fishes. In the present culture system the contribution of silver carp and silver barb to total fish production is high, so poor farmers who can not afford to buy expensive fish will be able to fulfill their protein demand by eating these cheap fishes.